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From R&D to Readiness: Navigating Technology Transitions with the Naval Power and Energy Systems Technology Development Roadmap

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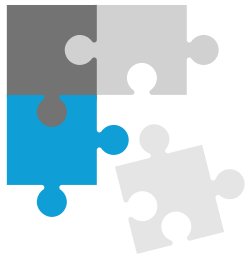
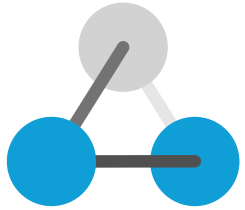
How can effective roadmapping better align research and acquisition to enhance warfighting energy systems?

Current State



Persistent Gaps between R&D and acquisition



Disjointed efforts across programs, labs, stakeholders

Slow adaptation to fast-moving threats and innovation

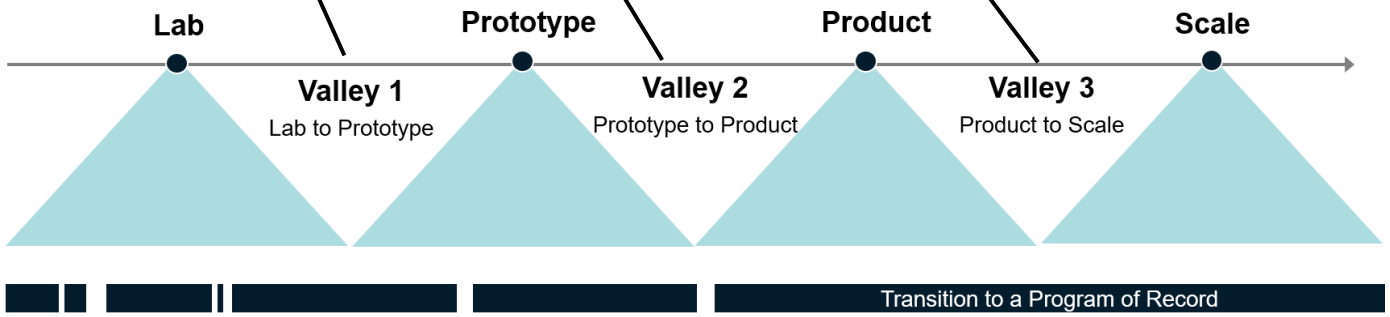
Without a roadmap, innovation drifts. With one, it arrives ready.

The Challenge: Technology Transition Valleys of Death

Integration: Complex systems demand modular integration paths, yet a lack of early validation environments delays fleet adoption.

Funding: Inconsistent funding disrupts development momentum and weakens continuity across DoD budgeting cycles.

Alignment: Siloed processes between R&D and acquisition hinder synchronized progress and delay capability delivery.



Methodology: Applying Technical Rigor to Roadmapping

We applied structured roadmapping theory to build a living framework that evolves with operational priorities.

Technology Landscape Assessment
- Pulls S&T inputs from industry, academia, and enterprise directives

Roadmapping Framework Design
- Based on established theory, aligned with Navy acquisition lifecycle

Iterative Readiness Evaluation
- Uses technology readiness levels (TRLs), system demos, system maturity gates

Gap Analysis & Strategic Updates
- Proactively identifies shortfalls, aligns with modernization timelines

Each iteration improves alignment between technological readiness and capability need

Gap analysis helps adjust roadmap pacing, ensuring relevance across platform lifecycle

The Transition from Prototype to Fleet Capability: Directed Energy Weapon Evolution

Timeline:

- 2014: LaWS fielded as prototype
- 2019: SSL-TM development shaped by NPES TDR
- 2020: SSL-TM deployed and tested on USS Portland

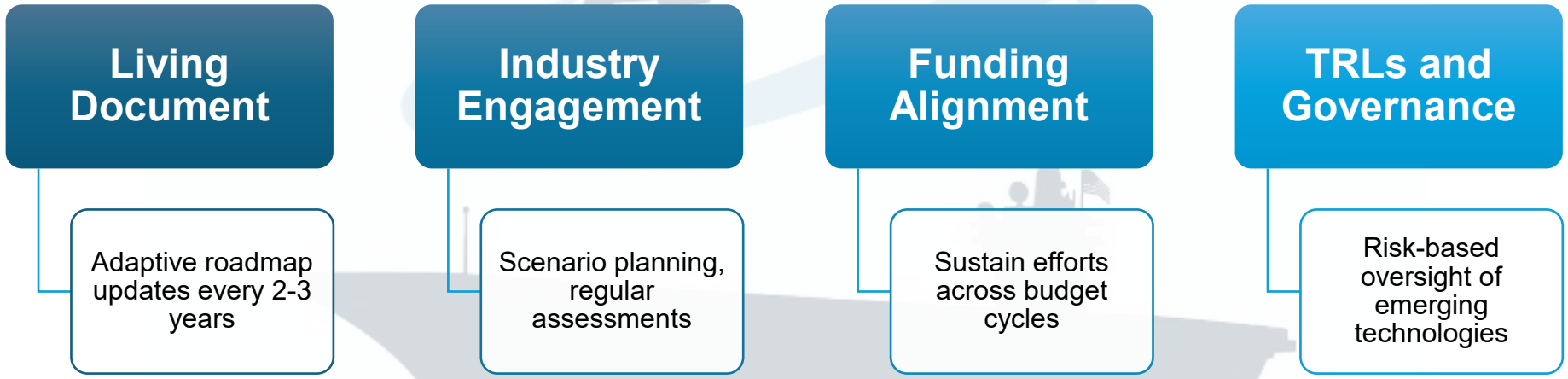
Integration Success:

- SSL-TM addressed LaWS limitations (power storage, targeting precision, scalability)
- Lessons from LaWS informed SSL-TM hardware, energy storage architecture, and cooling requirements

Roadmap Support:

- NPES TDR aligned energy storage R&D and testing environments
- Guided sequencing from LaWS demo to SSL-TM deployment and HELIOS transition on DDG 88

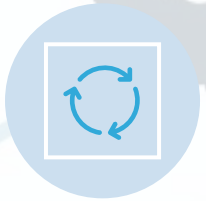
Sustaining Momentum: Four Pillars of Execution



Transition success comes from structure, not serendipity.

Delivering Future Readiness

Structured and adaptive roadmaps like NPES TDR are essential for innovation and capability deployment.



Roadmapping mitigates technical, operational, and financial risks across the acquisition lifecycle.

NPES TDR acts as a shared language among stakeholders—linking labs, industry, and leadership priorities.

Cross-functional collaboration is key to ensuring alignment between research, funding, and mission requirements.

Sustained investment in roadmapping accelerates the delivery of critical power and energy systems.

Roadmaps enable faster, more confident transitions from laboratory concept to Fleet capability.

Support the integration of structured roadmapping into every stage of acquisition. When readiness is the mission-**alignment is the force multiplier.**